CLAIMS

What is claimed is:

1. A method for recognizing stations in a home network of an OFDM-based system, wherein the home network includes starting and destination stations, the method comprising the steps of :

(a) assigning a node number to each station and assigning subchannels corresponding to the node number of each station;

(b) the starting station constructing tones corresponding to the subchannels assigned to its own node number and the node number of the destination station as single OFDM symbol, and placing the OFDM symbol in a frame for transmission; and

(c) stations other than the starting station detecting the tones from the frame, recovering the node number using indices of the subchannels obtained from the tones, and recognizing the starting station and the destination station.

2. The method for recognizing stations in a home network as claimed in claim 1, wherein the number of subchannels assigned to each node number in step (a) is calculated by dividing the number of total subcarriers by the number of nodes included in the home network.

3. The method for recognizing stations in a home network as claimed in claim 1, wherein the assignments of subchannels in step (a) are performed according to the following equation:

$$D_i = \{(k \bmod d) == DSN\}, k < N/2$$
$$S_i = \{(k \bmod d) == SSN\}, k > N/2, i = 1, \cdots, M/2,$$

where N indicates the number of total subcarriers, DSN indicates a node number of the destination station, SSN indicates a node number of the starting station, D_i indicates an index of a subchannel assigned to the destination station, and S_i indicates an index of a subchannel assigned to the starting station.

4. The method for recognizing stations in a home network as claimed in claim 1, wherein the OFDM symbol is placed in a foremost part of the frame in step (b).

5. The method for recognizing stations in a home network as claimed in claim 4, wherein in step (c) a station that determines that it is the destination station receives additional symbols of the frame, while stations other than the destination station do not receive the additional symbols of the frame.

6. The method for recognizing stations in a home network as claimed in claim 1, wherein the tones in step (b) that are assigned to the starting station are loaded into an upper band centering about a subcarrier frequency and the tones assigned to the destination station are loaded into a lower band centering about the same subcarrier frequency.

7. The method for recognizing stations in a home network as claimed in claim 1, in which phases of the tones in step (b) are rotated pseudo-randomly according to following equation:

$$X_k = \begin{cases} 0, k \neq S_i \text{ or } D_i, \ o \leq k \leq 256 \\ Q_k, k = S_i, \text{ provided } Q_k \text{ lotates by } p\pi/2, \ p = (k \bmod 4), \end{cases}$$

where D_i indicates indices of subchannels assigned to the destination station, and S_i indicates indices of subchannels assigned to the starting station.

8. The method for recognizing stations in a home network as claimed in claim 1, wherein the node number detection in step (c) is performed by detecting the node number of a corresponding station by modulo-calculating the indices of the subchannels by the maximum number of nodes constituting the home network.

9. The method for recognizing stations in a home network as claimed in claim 8,

wherein a node number that is most frequently detected is selected, if the node number is detected at least once.

10. The method for recognizing stations in a home network as claimed in claim 1, wherein the tone in step (b) is expressed as $\hat{x}_n = \sqrt{\frac{N}{M}} * \tilde{x}_n$ in the time domain in order to have the same power as the power of subsequent OFDM symbols,

where M indicates the number of subchannels assigned to a single node number, N indicates the number of total subcarriers, and $\tilde{x}_n$ indicates each modulated subcarrier in which a cyclic prefix is inserted.

11. A method for establishing a link between stations in a home network having a plurality of stations, the method comprising the steps of:

(a) a starting station constructing a frame including recognition information including a self-address and an address of a destination station, an average noise power reflecting channel properties of the starting station, and a training sequence, and transmitting the frame;

(b) the destination station determining whether it is the destination station based on the recognition information and estimating channel power and noise power from the received training sequence;

(c) the destination station selecting subchannels by using the estimated channel power, the noise power, and the average noise power, constructing location information of the selected subchannels as an OFDM symbol, and transmitting the OFDM symbol to the starting station; and

(d) the starting station recovering the OFDM symbol and detecting a final location of a final subchannel from location information of the subchannels.

12. The method for establishing a link between stations in a home network as claimed in claim 11, wherein the average noise power in step (a), which is based on a self-Near End crosstalk, is modeled according to the following equation:

$$PSD_{NEXT}(f) = S(f) k_N f^{1.5} (\frac{N_u}{49})^{0.6},$$

where k_N indicates a constant value of the self-Near End crosstalk, N_u indicates the number of users, and $S(f)$ indicates the power spectrum density of a signal transmitted from a corresponding transmission system.

13. The method for establishing a link between stations in a home network as claimed in claim 11, wherein the average noise power in step (a) is mapped to an OFDM symbol by QPSK and is loaded in the frame.

14. The method for establishing a link between stations in a home network as claimed in claim 11, wherein the estimation of the noise power in step (b) is performed using noise spectrum information of neighboring subchannels within a same group to detect the average noise power of the corresponding subchannel according to the following equation:

$$\tilde{N}_l = \frac{N}{G} \sum_{m=l\frac{N}{G}}^{(l+1)\frac{N}{G}-1} \hat{\sigma}_m^2, l = 0, \cdots, G-1,$$

where G indicates the number of groups to whole subchannels, L indicates the number of samples, and $\hat{\sigma}_m^2$ indicates a noise spectrum obtained from error signal dispersion according to the L samples in a mth subchannel.

15. The method for establishing a link between stations in a home network as claimed in claim 14, wherein the noise spectrum of the subchannel within the same group is applied in the same manner to the other subchannels within the group.

16. The method for establishing a link between stations in a home network as claimed in claim 11, wherein the selection of the subchannels in step (c) comprises the

substeps of:

calculating a signal-to-noise ratio of each subchannel by using the estimated channel power and noise power;

recovering the average noise power transmitted from the transmitting terminal by using the estimated channel power;

selecting subchannels according to a higher order of signal-to-noise ratios in comparison with the recovered average noise power; and

forming a reverse link by using a band that is formed of a group of consecutively selected subchannels.

17. The method for establishing a link between stations in a home network as claimed in claim 16, wherein the location information of the subchannels is loaded as tones into a starting part and an ending part of the group to form the OFDM symbol.

18. The method for establishing a link between stations in a home network as claimed in claim 17, wherein the detection of the locations in step (d) comprises the substeps of:

calculating signal–to-noise ratios from the power of the received signal and the average noise power in each subchannel and detecting subchannels having an SNR higher than a predetermined threshold value; and

detecting locations of the detected subchannel according to a manner in which the tones are loaded into the group.

19. The method for establishing a link between stations in a home network as claimed in claim 11, wherein, in step (c), the frame further comprises bit loading information, which includes the number of bits and a gain value to be coded in the starting station and the frame is transmitted through the selected subchannels.

20. The method for establishing a link between stations in a home network as claimed in claim 19, wherein the number of bits is assigned by using the signal-to-noise ratio according to the following equation:

$$b_m = \log_2\left(1+\frac{SNR_m}{\Gamma}\right),\ SNR_m = \frac{\varepsilon_m\left|\hat{P}_m\right|^2}{\left|\hat{\sigma}_m\right|^2},\ \Gamma = 9.8+\gamma_m-\gamma_c,$$

where SNR_m indicates an SNR of an mth subchannel, ε_m indicates symbol power assigned to each subchannel, $\left|\hat{P}_m\right|^2$ and $\left|\hat{\sigma}_m\right|^2$ respectively indicate an attenuation rate and noise power in each subchannel, Γ indicates an SNR-gap satisfying a performance level of 10e-7 BER, and γ_m and γ_c indicate a noise margin and coding gain, respectively.